

Applicants respectfully request entry of the above amendments prior to examination of the utility Application. If the Examiner cannot issue an immediate Notice of Allowance, the Examiner is invited to telephone the undersigned attorney with a view towards discussing the outstanding issues. No fee, other than those needed to file this utility application and its claims, is deemed necessary. However, if any additional fee is required, the Assistant Commissioner is hereby authorized to charge the amount of such fee to the undersigned attorney's Deposit Account No. 19-4709.

Early and favorable action is earnestly solicited.

Respectfully submitted,

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and use. Computed Radiography (CR) utilizes a phosphor screen with energy storage capability as an X-ray image receptor. The screen is contained in standard size radiographic cassettes and in integrated imaging stands or tables. The cassettes can be used in existing radiographic tables and stands.

Cassettes of the kind used in computed radiography may comprise a container having upper and lower parts that are hinged together so that they can be opened for insertion of a thin, flexible film sheet, imaging plate or rigid film plate comprising the photographic element. The cassette is closed and latched so that the cassette with the element therein can be used with an x-ray apparatus to produce an image on the photographic element. Then the cassette is taken to a reader where the cassette must be opened and the photographic element extracted by suitable feeders, such as suction feeding devices. The photographic element separate from the cassette is transported through the reader where it is stimulated to emit a radiation pattern and subsequently erased before being returned to the cassette for re-use.

This technology can offer diagnostic quality advantages over conventional film/screen methods and decreases in the time required for processing. Advantages of computed radiography include energy subtraction, which makes it possible to view bone-only and soft tissue-only images of the chest, dynamic range control and gradation processing, which makes it possible to see both bone and soft tissue on the same image.

With computed radiography, the cassettes are transferred to a reader system, or in the case of integrated devices, the reading section of the device. Here the imaging plate is scanned with a finely-focused laser beam which stimulates luminescence proportional to the local X-ray exposure. The luminescence signal is converted to an electrical signal and is thereby digitized. The data representing the image is subjected to digital signal processing to optimize the diagnostic content of the visualized data. The image can be recorded on laser printed film transmitted or stored digitally.

Gradation processing is done via computer to optimize image contrast and optical density. Image contrast can be adjusted as desired, in accordance with the anatomical region and diagnostic purpose.

Energy subtraction expands diagnostic capabilities by providing a user with three views instead of just one: the standard radiograph, a bone subtracted radiograph and a soft tissue subtracted radiograph.

Cassette Construction

Typically an X-ray film cartridge is composed of a rectangular cartridge body and a rectangular cover hinged to the body. The cover is locked by means of a pair of latches mounted to one side of the cover opposite to the side hinged to the body. Often, a cushion pad is interposed between the cover and at least one intensifying sheet attached to the cover so as to press the intensifying sheet against the X-ray film. The cover is of rectangular shape and has hinges on one side edge thereof and latch means on the opposite ends thereof. The hinge is usually composed of a pair of hinges to pivotally mount the cover at one side thereof to the body, and the latch typically is composed of a pair of latches slidably mounted to the cover to be engaged with a pair of slots provided in one side wall of the cartridge body. Therefore, the hinged cover is held to the cartridge body at four points.

The above described conventional X-ray film and film cassette, whether viewed as a typical x-ray photograph or digitized through computer radiography techniques using storage phosphor imaging plates, has a defect in that the film or visualizing element fitting within the cassette is generally not long enough to provide a full view of the spine (e.g. for scoliosis patients) or the other long bones of the body. To remedy this situation the prior art has relied multiple and sequential x-ray exposures or other more expensive procedures, such as CT scans or magnetic resonance imaging (MRI). The sequential x-ray photographs of the prior art invariably left a small portion of the structure to be imaged off the x-ray photographs, leading to a gap in the diagnostic ability of x-ray procedures. Meanwhile, though the more expensive MRI imaging can be used to evaluate the spinal cord and spinal nerves this capability is often missing from existing clinical institutions or is not available on a routine basis. As with all studies, MRI is done for a specific indication and correlated with clinical examination.

Myelography, a radiographic study which uses an injected

existing between even two sequentially used imaging plates (IP). To resolve this failure the current invention may provide for a modified cassette structure designed to accommodate securely two overlapping image plates. The top and bottom of the "Z" fold should be folded under the fabric inside the cassette so the IP's do not strike the edge of the "Z" film when being placed in the cassette. For the overlapping IP's a "Z" folded sheet of fabric or other suitable material can be used as a separator at the junction of the two cassettes. Preferably, the "Z" folded sheet is made of a polyester material. In addition the "Z" folded sheet may also be lined on both sides with phosphor imaging materials.

As previously mentioned, the "Z" film must overlap. Preferably, this overlap is less than 0.5 of an inch. Preferably, the "Z" fold is fabricated out of polyester material.

To accommodate this change the size of standard cassettes may be altered to provide for sufficient overlap of imaging plates. When employed in this fashion sequential x-ray photographs retain the full-length image of a desired object, such as an individual's spine, without loss of any diagnostic information. Typically the cassette will need to be shortened by up to 1.0 inch to provide sufficient overlap, preferably the modified cassette holder will be shortened by 0.5 inch.

The method in accordance with the present invention comprises maintaining an X-ray film and a stimulable phosphor sheet in close contact with each other and shielded from light, and exposing said X-ray film and said stimulable phosphor sheet to X-rays through an object, whereby a x-ray image of said object is scanned by a laser and digitally recorded on said stimulable phosphor sheet and, at the same time, said X-ray film is exposed to light instantaneously emitted from said stimulable phosphor sheet upon exposure to X-rays to record a photographic latent image of the same x-ray image on said X-ray film. It should be noted that the invention could also be carried out by utilizing a photostimulable phosphor sheet alone according to the above method.

Thus, it can be appreciated that an x-ray cassette system and film therefore have been presented which will facilitate an improvement in the diagnostic use of x-ray photographs, particularly for the spine and the other long bones of an individual animal.

ABSTRACT OF THE DISCLOSURE

A method of taking an extended X-ray photograph by using an imaging plate or a computed radiography cassette devised to contain a longer digital X-ray image such that a longer complete image of a subject may be rendered such that no diagnostic information is lost in examinations of scoliosis or the long bones of the body. When the cassette is exposed to X-rays through an object, an X-ray transmission image of the object is recorded on a stimulable phosphor sheet and, at the same time, the X-ray film is exposed to light instantaneously emitted from the stimulable phosphor sheet upon exposure to X-rays to record an extended photographic latent image of the X-ray transmission image of the object on the X-ray film or a photostimulable phosphor sheet alone --